PROCESS FOR QUALIFYING ACCURACY OF A NUMERICALLY CONTROLLED MACHINING SYSTEM

ABSTRACT OF THE DISCLOSURE

Positioning errors of a multi-axis numerically controlled machine and a flexible workpiece holding fixture are related through a mathematical model to the statistical total error in the position of the machine tool (e.g., a drill bit for drilling holes), and maximum allowable amounts are assigned for each of the individual contributing factors to the total error. The math model allows all of the errors or tolerances of the machine and holding fixture to be distributed in a realistic manner in order to keep the resulting accuracy in production parts within acceptable limits. The relationship between the machine and fixture is checked by a probe mounted in the machine spindle which probes the holding fixture and measures the positions of movable holding members of the fixture. Functioning and alignment of the probe are checked with the probe against a fixed monument. Global positioning accuracy of the machine is checked throughout a working envelope of the machine using a laser measuring instrument. A master coordinate system relative to the ways of the machine is created within the laser instrument by calculating a linear fit of machine position coordinates acquired as the machine is moved along each of two perpendicular axes of the machine, and the master coordinate system is used for the global accuracy and fixture accuracy checks, thus eliminating the need for a foundation-based reference system.

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